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Takatani

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(54) **INFORMATION PROCESSING APPARATUS, CONTROL METHOD OF INFORMATION PROCESSING APPARATUS, AND PROGRAM**

(75) Inventor: **Tamotsu Takatani**, Yokohama (JP)

(73) Assignee: **Canon Kabushiki Kaisha**, Tokyo (JP)

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(58) **Field of Classification Search**

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USPC 713/168, 189, 193; 380/270, 277

See application file for complete search history.

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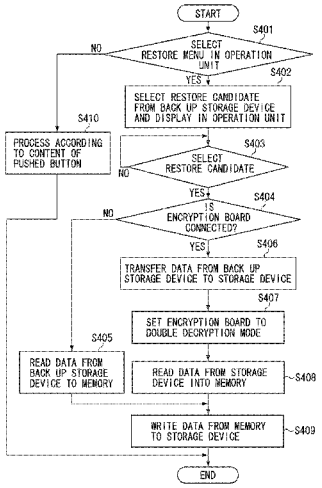
Primary Examiner — Kari Schmidt

(74) *Attorney, Agent, or Firm* — Canon U.S.A., Inc. IP Division

(57) **ABSTRACT**

An information processing apparatus includes a decryption processing unit, a backup unit, and a control unit. The decryption processing unit is configured to decrypt encrypted data read from a first storage unit storing the encrypted data. The backup unit is configured to back up the encrypted data stored in the first storage unit to a second storage unit. When the backup unit backs up the encrypted data stored in the first storage unit to a second storage unit, the control unit is configured to control the decryption processing unit to store the encrypted data read from the first storage unit, in the second storage unit without performing decrypting processing.

3 Claims, 7 Drawing Sheets



(51) **Int. Cl.**

G06F 21/85	(2013.01)
H04N 1/44	(2006.01)
H04N 1/00	(2006.01)

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FIG. 1

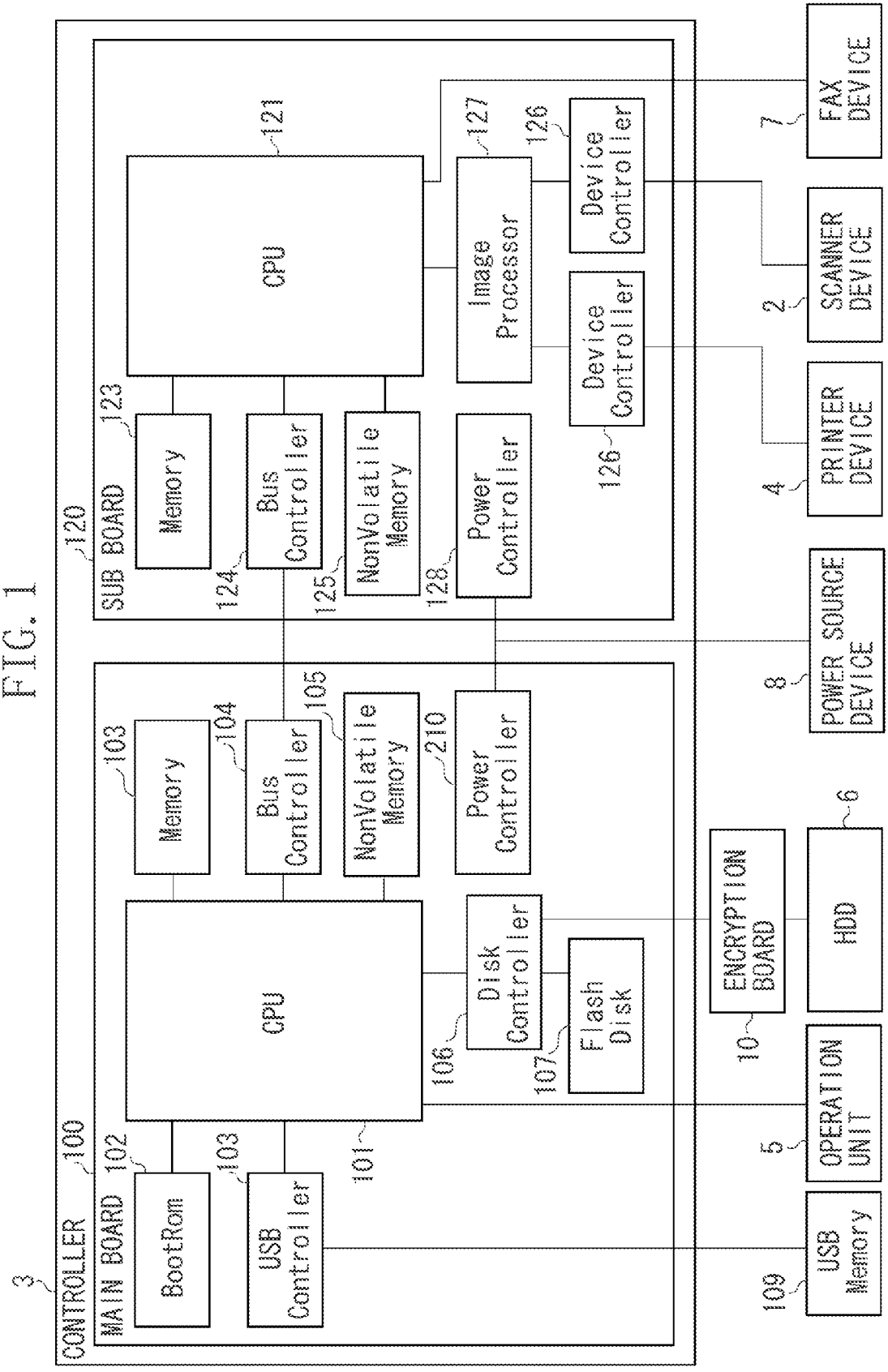

3
CONTROLLER
100
MAIN BOARD
102
BootRom
103
USB Controller
101
CPU
103
Memory
104
Bus Controller
105
NonVolatile Memory
210
Power Controller
106
Disk Controller
107
Flash Disk
120
SUB BOARD
123
Memory
124
Bus Controller
125
NonVolatile Memory
128
Power Controller
121
CPU
127
Image Processor
126
Device Controller
126
Device Controller
109
USB Memory
5
OPERATION UNIT
10
ENCRYPTION BOARD
6
HDD
8
POWER SOURCE DEVICE
4
PRINTER DEVICE
2
SCANNER DEVICE
7
FAX DEVICE

FIG. 2A

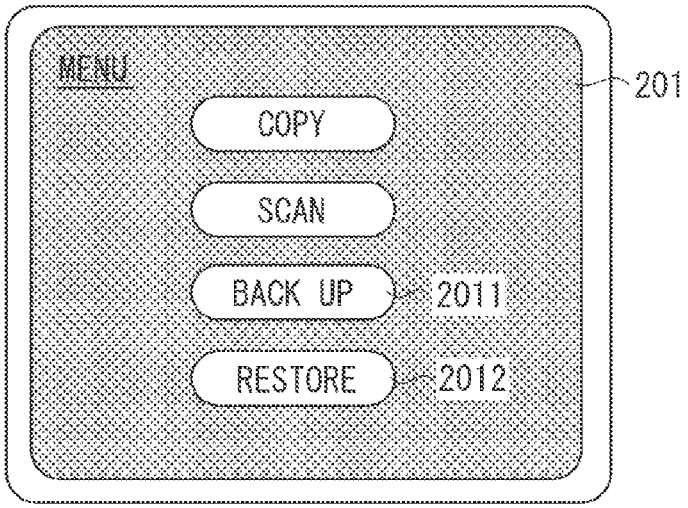


FIG. 2B

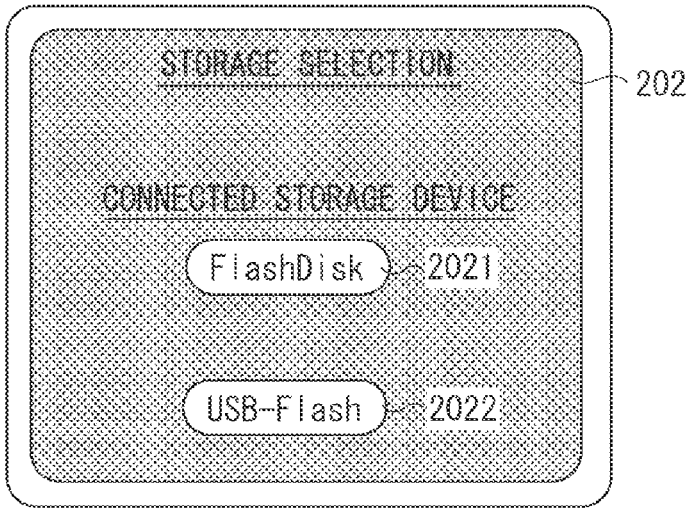


FIG. 2C

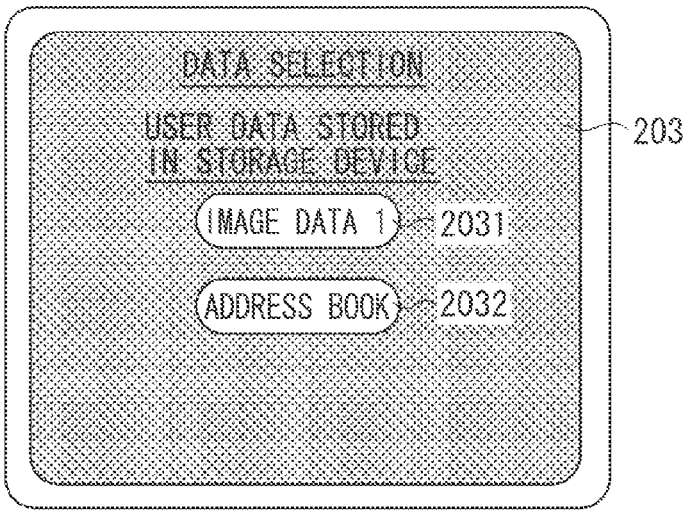


FIG. 3

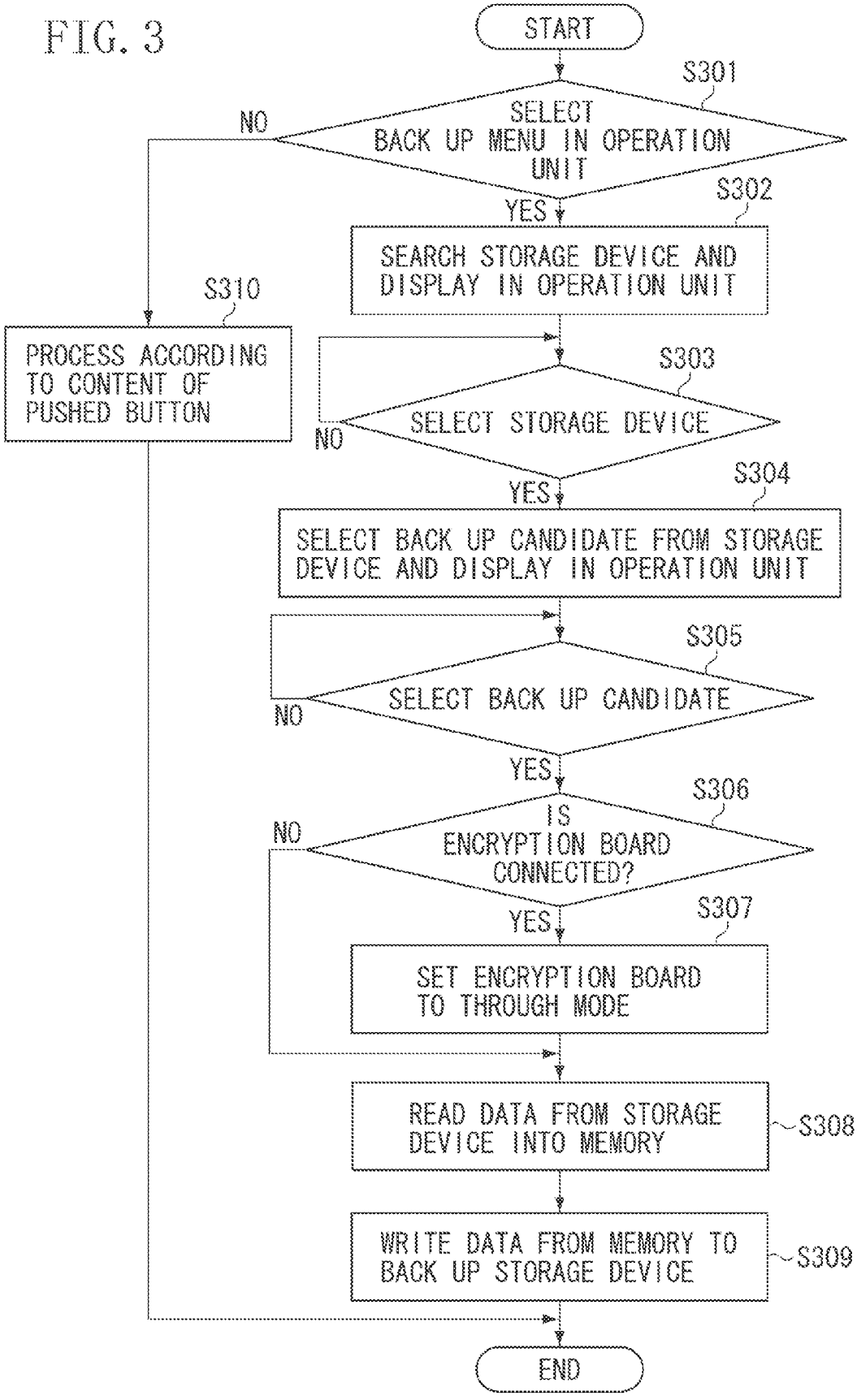

START
S301
SELECT BACK UP MENU IN OPERATION UNIT
NO
YES
S302
SEARCH STORAGE DEVICE AND DISPLAY IN OPERATION UNIT
S310
PROCESS ACCORDING TO CONTENT OF PUSHED BUTTON
S303
SELECT STORAGE DEVICE
NO
YES
S304
SELECT BACK UP CANDIDATE FROM STORAGE DEVICE AND DISPLAY IN OPERATION UNIT
S305
SELECT BACK UP CANDIDATE
NO
YES
S306
IS ENCRYPTION BOARD CONNECTED?
NO
YES
S307
SET ENCRYPTION BOARD TO THROUGH MODE
READ DATA FROM STORAGE DEVICE INTO MEMORY
S308
WRITE DATA FROM MEMORY TO BACK UP STORAGE DEVICE
S309
END

FIG. 4

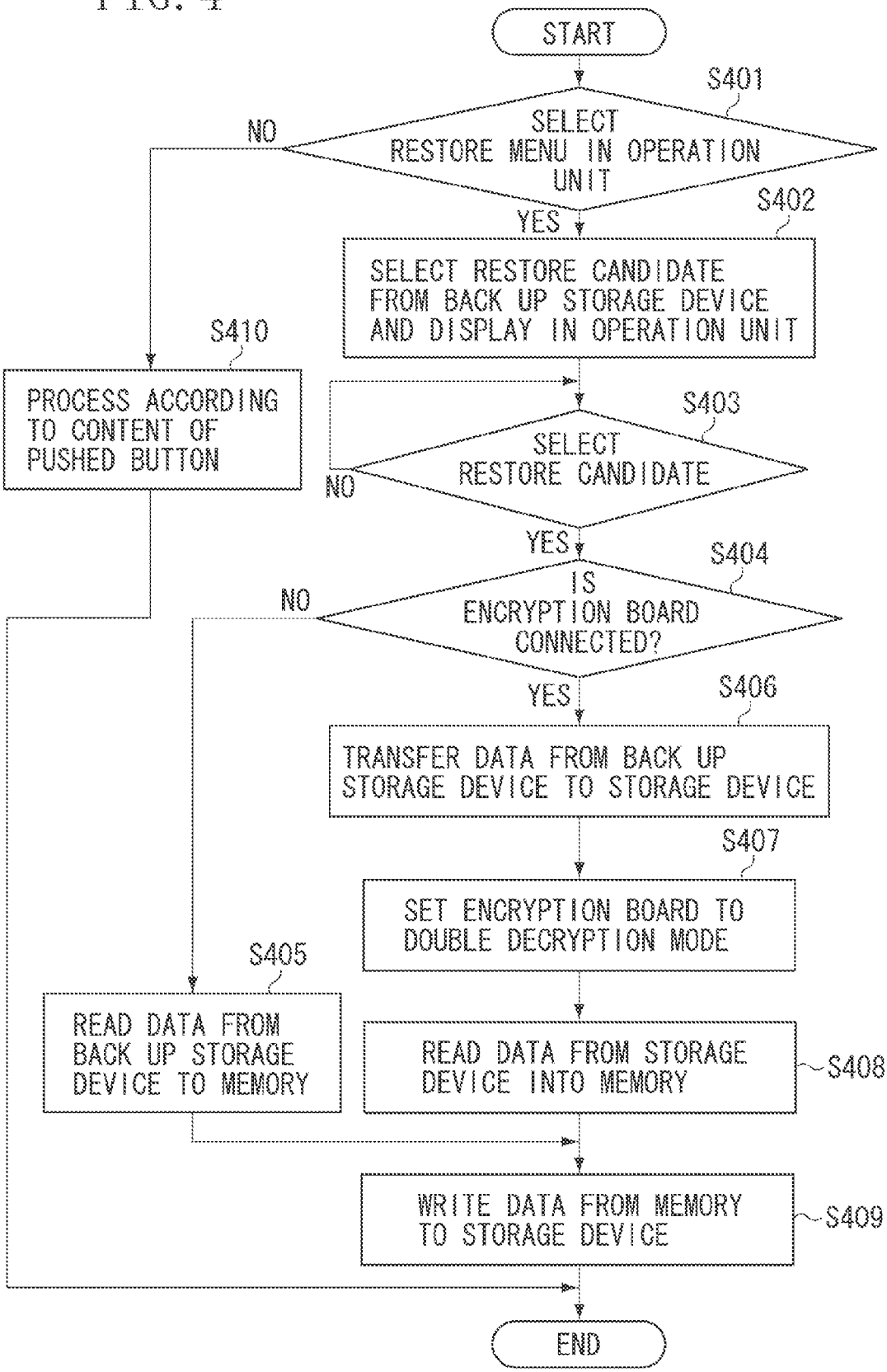

START
S401
SELECT RESTORE MENU IN OPERATION UNIT
NO
YES
S402
SELECT RESTORE CANDIDATE FROM BACK UP STORAGE DEVICE AND DISPLAY IN OPERATION UNIT
S410
PROCESS ACCORDING TO CONTENT OF PUSHED BUTTON
S403
SELECT RESTORE CANDIDATE
NO
YES
S404
IS ENCRYPTION BOARD CONNECTED?
NO
YES
S406
TRANSFER DATA FROM BACK UP STORAGE DEVICE TO STORAGE DEVICE
S407
SET ENCRYPTION BOARD TO DOUBLE DECRYPTION MODE
S405
READ DATA FROM BACK UP STORAGE DEVICE TO MEMORY
READ DATA FROM STORAGE DEVICE INTO MEMORY
S408
WRITE DATA FROM MEMORY TO STORAGE DEVICE
S409
END

FIG. 5

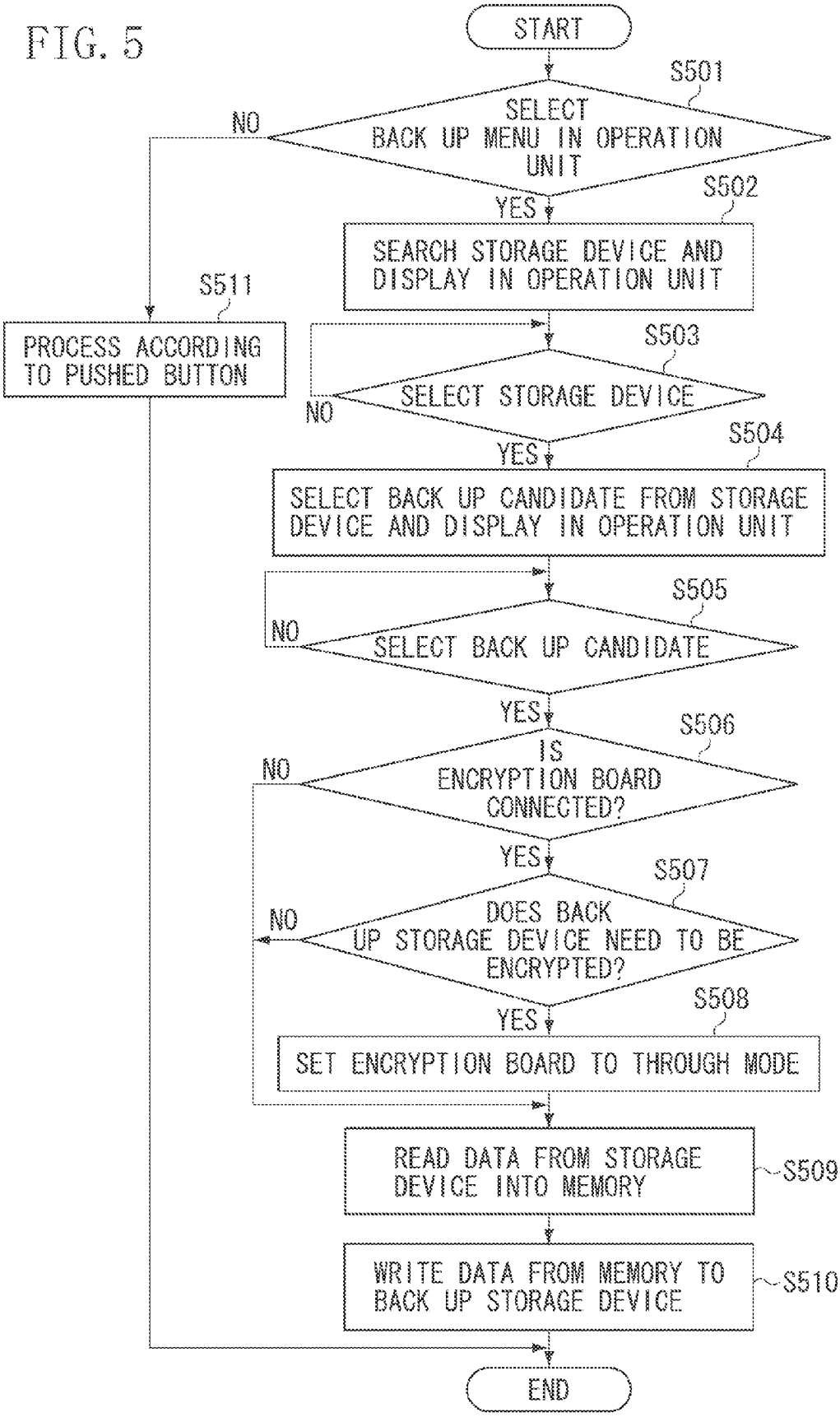

START
S501
SELECT BACK UP MENU IN OPERATION UNIT
NO
YES
S502
SEARCH STORAGE DEVICE AND DISPLAY IN OPERATION UNIT
S511
PROCESS ACCORDING TO PUSHED BUTTON
S503
SELECT STORAGE DEVICE
NO
YES
S504
SELECT BACK UP CANDIDATE FROM STORAGE DEVICE AND DISPLAY IN OPERATION UNIT
S505
SELECT BACK UP CANDIDATE
NO
YES
S506
IS ENCRYPTION BOARD CONNECTED?
NO
YES
S507
DOES BACK UP STORAGE DEVICE NEED TO BE ENCRYPTED?
NO
YES
S508
SET ENCRYPTION BOARD TO THROUGH MODE
READ DATA FROM STORAGE DEVICE INTO MEMORY
S509
WRITE DATA FROM MEMORY TO BACK UP STORAGE DEVICE
S510
END

FIG. 6A

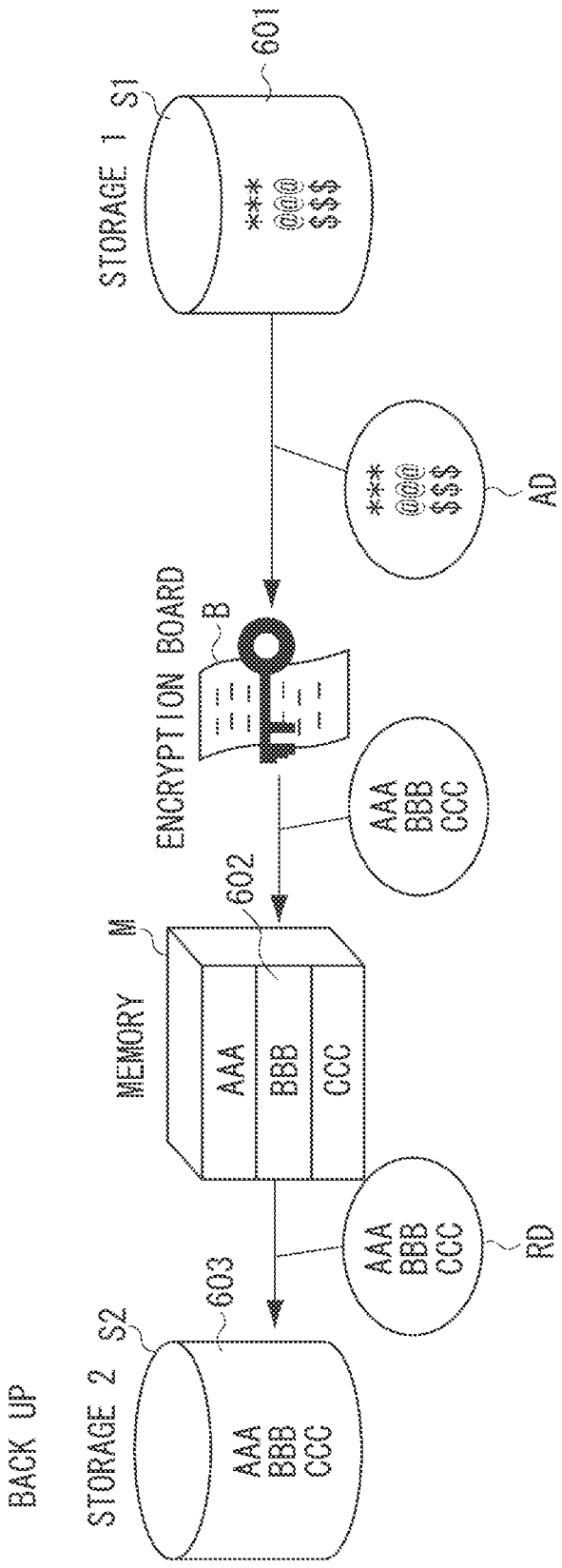
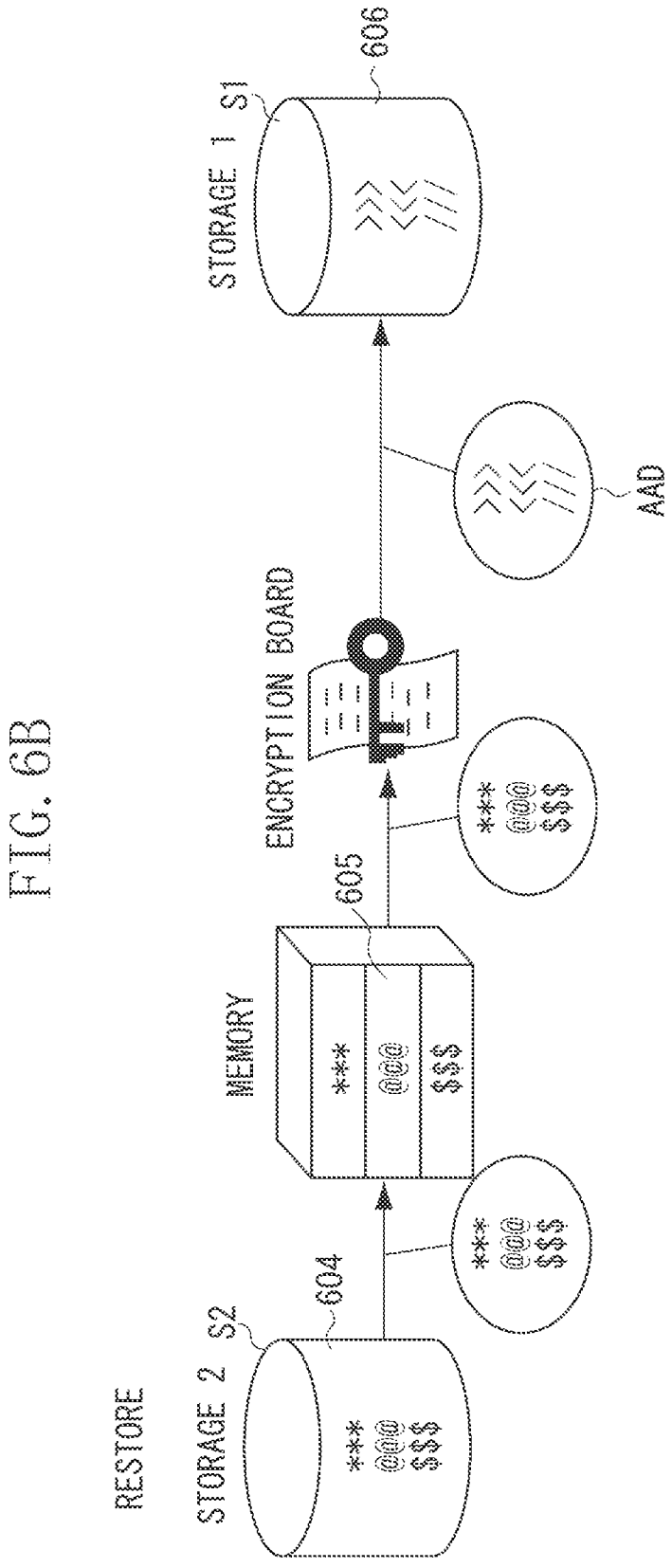

601
STORAGE 1 S1
***
@@@
$$$
AD
ENCRYPTION BOARD
B
AAA
BBB
CCC
602
M
MEMORY
AAA
BBB
CCC
RD
603
STORAGE 2 S2
BACK UP

FIG. 6B


RESTORE
STORAGE 2 S2
604
MEMORY
605
ENCRYPTION BOARD
STORAGE 1 S1
606
AAD
*** @@@ $$$

INFORMATION PROCESSING APPARATUS, CONTROL METHOD OF INFORMATION PROCESSING APPARATUS, AND PROGRAM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an information processing apparatus including a storage device, a control method of the information storage apparatus, and a program.

2. Description of the Related Art

In an image forming apparatus, a storage function, which includes a mass-storage device such as a hard disk drive (HDD) and stores image data scanned by a scanner unit, has been realized. Further, a function capable of storing data other than the scanned image data, received from a personal computer terminal in the above HDD has been also realized, so that the image forming apparatus very often functions as a storage.

Further, since important data is stored in a mass-storage device, it is necessary to secure safety of these data. Thus, for example, Japanese Patent Application Laid-Open No. 2005-149025 discusses a technique to realize a function to perform encryption of data by attaching an encryption board to a mass-storage device in an image forming apparatus.

In the aforementioned image forming apparatus, when encrypted data stored in an mass-storage device is backed up to another storage by using the encryption board, there have been a problem illustrated in FIG. **6**.

FIG. **6** illustrates conventional backup processing and restoring processing of data. FIG. **6**A corresponds to the backup processing and FIG. **6**B corresponds to the restoring processing.

In FIG. **6**A, a storage **S1** is an HDD and a storage **S2** is a semiconductor storage device, for example, a flash disk or an external storage connected to a universal serial bus (USB) controller **108** as a destination. The storage **S2** is a storage for backing up data stored in the storage **S1**.

The storage **S1** stores encrypted data AD and backs it up to the storage **S2** as illustrated in FIG. **6**A. The stored encrypted data AD is read into a memory M. Since the encrypted data AD backed up in the memory M has passed through an encryption board B, the data is decrypted and becomes plain text data RD. Thus, when the encrypted data AD read into the memory M is written in the storage **S2**, the plain text data RD is backed up to the storage **S2**. In other words, the encrypted data AD stored in the storage **S1** is backed up to the storage **S2** as the plain text data. Therefore, it becomes difficult to retain security of the backed up data.

Further, in FIG. **6**B, there is the encrypted data AD in the storage **S2** and the data is restored to the storage **S1**.

In this case, the encrypted data AD is read from the storage **S2** into the memory M. There is the encrypted data AD on the memory M and the data AD is written in the storage **S1**. Since the encrypted data AD read into the memory M passes through an encryption board B, the data AD is further encrypted and restored to the storage **S1** as doubly encrypted data AAD.

To deal with such a situation, an encryption board can be attached to the other storage. However, two encryption boards are used in this case, so that a production cost increases. Further, it is not realistic to doubly manage keys used in encryption/decryption.

SUMMARY OF THE INVENTION

The present invention provides a system capable of normally backing up encrypted data without lowering a security level, even when the encrypted data is stored in a storage device. Further, the present invention provides, when the backed-up encrypted data is restored, a system for preventing double encryption of the data in the restoring, so that the encrypted data can be normally restored.

According to an aspect of the present invention, an information processing apparatus includes a decryption processing unit, a backup unit, and a control unit. The decryption processing unit is configured to decrypt encrypted data read from a first storage unit storing encrypted data. The backup unit is configured to back up encrypted data stored in the first storage unit to a second storage unit. When the backup unit backs up encrypted data stored in the first storage unit to the second storage unit, the control unit is configured to control the decryption processing unit to store encrypted data read from the first storage unit, in the second storage unit without performing decryption.

Further, according to another aspect of the present invention, the information processing apparatus includes an encryption/decryption processing unit, a restoring unit, and a control unit. The encryption/decryption processing unit is configured to encrypt data to be written in the first storage unit and decrypts encrypted data read from the first storage unit. The restoring unit is configured to restore encrypted data stored in the second storage unit to the first storage unit. When the restoring unit restores encrypted data in the second storage unit to the first storage unit, the control unit is configured to control to further encrypt encrypted data read from the second storage processing unit and store in the first storage unit by using the encryption/decryption processing unit, and control the encryption/decryption processing unit to doubly decrypt the doubly encrypted data read from the first storage unit, encrypt the doubly decrypted data, and write the encrypted data in the first storage unit.

Further features and aspects of the present invention will become apparent from the following detailed description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate exemplary embodiments, features, and aspects of the invention and, together with the description, serve to explain the principles of the invention.

FIG. **1** is a block diagram illustrating an example of an information processing apparatus according to the present invention.

FIGS. **2**A, **2**B and **2**C illustrates an example of a user interface (UI) screen displayed on an operation unit.

FIG. **3** is a flow chart illustrating data processing steps of the information processing apparatus.

FIG. **4** is a flow chart illustrating data processing steps of the information processing apparatus.

FIG. **5** is a flow chart illustrating data processing steps of the information processing apparatus.

FIGS. **6**A and **6**B illustrate data processing examples performed by a plurality of storage devices.

DESCRIPTION OF THE EMBODIMENTS

Various exemplary embodiments, features, and aspects of the invention will be described in detail below with reference to the drawings.

FIG. **1** is a block diagram illustrating an example of an information processing apparatus according to a first exem-

plary embodiment. In this exemplary embodiment, an image forming apparatus configured of a multi faction peripheral will be described, as an example of an information processing apparatus. However, the present invention is not limited to the image forming apparatus as long as the apparatus includes a system which performs backup processing and restoring processing of data stored in one storage device by using a plurality of storage devices. In this exemplary embodiment, a first storage device is a hard disk and a second storage device is configured of a USB memory or a flash disk (SSD), which are described later, will be described. However, the first storage device and the second storage device are not limited to the above description.

In FIG. **1**, a controller **3** includes a main board **100** and a sub board **120**. The main board **100** includes a central processing unit (CPU) **101**, a boot ROM **102**, a memory **103**, a bus controller **104**, and a nonvolatile memory **105**. The CPU **101** controls the entirety board. The boot ROM **102** includes a boot program. The CPU **101** uses the memory **103** as a work memory. The bus controller **104** has a bridge function with an external bus. The non volatile memory **105** is a memory in which data does not disappear even when a power source is shut down.

Further, the main board **100** includes a disk controller **106**, which controls a storage device. The disk controller **106** connects to a flash disk (SSD) **107** which is configured of a semiconductor device and is a relatively small capacity storage device. The disk controller **106** further connects to a hard disk device (HDD) **6** via an encryption board **10**. Further, the main board **100** includes a USB controller **108** and connects to a USB memory **109**.

At an external of the main board **100**, the USB memory **109**, an operation unit **5**, the HDD **6**, and the encryption board **10** are connected. The encryption board **10** functions as an encryption/decryption processing unit and is connectable to the HDD **6**.

When the CPU **101** requests the disk controller **106** to read data from the HDD **6**, encrypted data is read from the HDD **6**, decrypted at the encryption board **10**, and stored in the memory **103** via the disk controller **106** and the CPU **101**. On the other hand, when the CPU **101** requests the disk controller **106** to write data to the HDD **6**, plain text data is encrypted at the encryption board **10** and written in the HDD **6**. Thus, an operation mode in which the encryption board **10** decrypts data read from the HDD **6** or encrypts data to be written in the HDD **6** is referred to as a normal mode.

On the other hand, the encryption board **10** can also transfer encrypted data to the disk controller **106** as it is, without decrypting the encrypted data read from the HDD **6**. A mode performing such an operation is referred to as a through mode. A case where the encryption board **10** operates in the through mode will be described in detail below.

Further, the encryption board **10** can read data once written in the HDD **6** from the HDD **6**, decrypt the read data twice, write the decrypted data in the memory **103**, encrypt again the data written in the memory **103**, and write the encrypted data in the HDD **6**. An operation mode in which the encryption board **10** performs decryption processing twice is referred to as a double decryption mode. A case where the encryption board **10** operates in the double decryption mode will be described in detail below.

A sub board **120** is configured of a CPU system and image processing hardware. The sub board **120** includes a CPU **121**, a memory **123**, a bus controller **24**, and a nonvolatile memory **125**. The CPU **121** controls the entire sub board. The CPU **121** uses the memory **123** as a work memory. The bus controller **124** has a bridge function with an external bus. The nonvolatile memory **125** is a memory in which data is not disappeared when a power source is shut down.

Further, sub board **120** includes an image processor **127** for performing real time digital image processing and a device controller **126**.

A scanner apparatus **2** and a printer apparatus **4** transfer digital image data via the device controller **126**. The CPU **121** directly controls a facsimile apparatus **7**.

In addition, power source of the main board **100** and the sub board **120** is supplied from a power source device **8**. Power controllers **210** and **128** supply electric power to each unit on the main board **100** and sub board **120** which need electric power.

In the present exemplary embodiment, the CPU **101** and the CPU **121** include many peripheral hardware, such as a chip set, a bus bridge, and a clock generator. Although those are omitted because their description is not necessary, this block configuration does not limit the present invention.

Then, an operation of the controller **3** will be described referring to an example of image copying.

When a user instructs image copying from the operation unit **5**, the CPU **101** transmits an image reading command to the scanner apparatus **2** via CPU **121**. When the scanner apparatus **2** receives the command, the scanner apparatus **2** optically scans a sheet document and converts it to digital image data. The scanner apparatus **2** inputs digital image data to the image processor **127** via the device controller **126**.

The image processor **127** performs direct memory access (DMA) transfer to the memory **123** via the CPU **121** and temporarily stores the digital image data in the memory **123**.

When the CPU **101** confirms that a predetermined amount or the entire digital image data is input in the memory **123**, the CPU **101** outputs an image output instruction to the printer apparatus **4** via the CPU **121**. The CPU **121** notifies a position of the image data in the memory **123** to the image processor **127**. According to a synchronized signal from the printer apparatus **4**, the image data on the memory **123** is transmitted to the printer apparatus **4** via the image processor **127** and the device controller **126** and then, the digital image data is printed on a paper sheet in the printer apparatus **4**.

When the image forming apparatus performs a plurality of printings, the CPU **101** stores the image data saved in the memory **123**, in the HDD **6**, and can transmit the digital image data to the printer apparatus **4** without receiving the digital image data from the scanner apparatus **2** concerning the second copy or subsequent ones. In this case, the image data stored in the HDD **6** is encrypted by the encryption board **10**.

FIG. **2** illustrates an example of an operation screen (user interface: UI) displayed on the operation unit **5** illustrated in FIG. **1**.

In FIG. **2**, a screen **201** is a menu screen displayed at the highest hierarchy and has a function calling each function of the image forming apparatus.

A button **2011** is a button for instructing backup of data stored in the HDD **6**. When a user selects the button **2011**, the screen is transferred to a screen **202**. A button **2012** is a button for executing restoring. The screen **202** is a screen for displaying and selecting from a list of storage devices connected to the image forming apparatus.

For example, when a flash disk **107** and a USB memory **109** are connected to the image forming apparatus, these storage devices are displayed as the buttons **2021** and **2022**. By selecting either the button **2021** or the button **2022**, a user can select a storage which is a backup destination.

A screen **203** is a screen for displaying and selecting back up or restore target data. The screen **203** displays user data

stored in the HDD **6**, the flash disk **107**, or the USB memory **109** in the image forming apparatus.

For example, a button **2031** for selecting image data **1** and a button **2032** for selecting an address book are displayed on the screen **203**. A user can select data to be backed up or restored by selecting the button **2032** on the screen **203**.

FIG. **3** is a flowchart illustrating data processing steps of the image forming apparatus in the present exemplary embodiment. As an example, the backup processing **1** is performed in the image forming apparatus illustrated in FIG. **1**. The CPU **101** realizes each step by loading a control program from the HDD **6** to the memory **103** to execute them.

In step S**301**, the CPU **101** determines a kind of the button selected by a user in a backup menu displayed on the operation unit **5** as illustrated in FIG. **2**A. When the CPU **101** determines that the user has selected the button **2011** for back up (YES in step S**301**), the processing proceeds to step S**302**. When the CPU **101** determines that the user pushes a button other than the button **2011** (NO in step S**301**), the processing proceeds to step S**310**, and the CPU **101** executes processing corresponding to a content of the pushed button and ends the present flowchart.

In step S**302**, the CPU **101** searches a storage device for back up, which is connected to the image forming apparatus, and displays the storage selection screen **202** on the operation unit **5** as illustrated in FIG. **2**B. The storage selection screen **202** contains the button for selecting the searched storage device. The CPU **101** searches storages devices connected to the image forming apparatus at a time of transit from step S**301** to step S**302**.

In this searching operation, the CPU **101** detects, for example, the flash disk **107** mounted inside the main board **100** and the USB memory **109** connected via the USB controller **108**. Therefore, in the present exemplary embodiment, the button **2021** and the button **2022** are displayed on the operation unit **5**. The button **2021** selects the flash disk **107** and the button **2022** selects the USB memory **109** as a selected storage device.

In step S**303**, the CPU **101** determines whether the user has selected either the flash disk **107** or the USB memory **109** as a storage device for back up, on the storage selection screen illustrated in FIG. **2**B. More specifically, the CPU **101** determines whether the user has selected the button **2021** or the button **2022** on the storage selection screen illustrated in FIG. **2**B.

The user selects, on the storage selection screen illustrated in FIG. **2**B, either the flash disk **107** or the USB memory **109** as a storage device for back up. The CPU **101** stores information according to the storage device corresponding to the selected button in the memory **103**.

In step S**304**, the CPU **101** searches data in the HDD **6** and displays the button **2031** and the button **2032** on the operation unit **5** as illustrated in FIG. **2**C. The button **2031** and the button **2032** are buttons for selecting data of backup candidates. The backup candidate is image data and an address book which are stored in the HDD **6**. In addition, CPU **101** displays the button **2031** and the button **2032** on the operation unit **5** in association with information indicating the backup candidates. The associated information is a directory name and a file name of the information stored in the HDD **6**.

In step S**305**, the CPU **101** determines whether the user has selected the button **2031** or the button **2032** as a button for instructing the backup candidate. In the present exemplary embodiment, as illustrated in FIG. **2**C, the image data **1** and the address book are displayed on the operation unit **5** as data of the backup candidate. When the CPU **101** determines that the user has selected one of buttons (YES in step **305**), the CPU **101** stores information corresponding to the selected button in the memory **103**, and the processing proceeds to step S**306**. In addition, the user may not select the data of the backup candidate. In such a case, the entire data stored in the HDD **6** becomes an object to be backed up.

In step S**306**, the CPU **101** determines whether the encryption board **10** is connected to the image forming apparatus. When the CPU **101** determines that the encryption board **10** is connected to the image forming apparatus (YES in step S**306**), the processing proceeds to step S**307**. When the CPU **101** determines that the encryption board **10** is not connected to the image forming apparatus (NO in step S**306**), the processing proceeds to step S**308**.

In step S**307**, the CPU **101** sets the through mode to the encryption board **10** as a mode for reading data from the HDD **6**. More specifically, when the CPU **101** reads data encrypted and stored in the HDD **6**, the CPU **101** sets to the encryption board **10**, a mode which reads the encrypted data into the memory **103** without decryption.

In step S**308**, the CPU **101** reads target data (the image data **1** or the address book) from the HDD **6** into the memory **103**, based on the button selected by the user as the backup target in step S**305**.

At this time, since the CPU **101** sets the through mode to the encryption board **10** in step S**307**, the encrypted data stored in the HDD **6** is read into the memory **103** in an encrypted state.

In step S**309**, the CPU **101** writes the data into the memory **103** in step S**308**, to the storage device (the flash disk **107** or the USB memory **109**) selected in step S**303**.

Accordingly, in the first exemplary embodiment, when the CPU **101** determines that the encryption board **10** is connected to the image forming apparatus in step S**306**, the CPU **101** writes data in an encrypted state to a storage device which is a backup target, since the data in the encrypted state is stored in the memory **103** in step S**308**. In other words, the data which is selected as a backup target and read from HDD **6** into the memory **103**, and the data which is written from the memory **103** to the HDD **6**, are in an encrypted state at a time of backup processing. These data are encrypted and stored in the HDD **6**. Therefore, security of the backed up data can be retained.

FIG. **4** is a flowchart illustrating data processing steps of the information processing apparatus according to the first exemplary embodiment. In this case, as an example, a restoring processing is executed in the image forming apparatus illustrated in FIG. **1**. The CPU **101** realizes each step by loading a control program from HDD **6** to the memory **103** to execute it.

In step S**401**, the CPU **101** determines whether a user has selected the button **2012** for restoring from the buttons displayed on the operation unit **5**, in the menu screen illustrated in FIG. **2**. When the CPU **101** determines that the user has selected the button **2012** for restoring (YES in step S**401**), the processing proceeds to step S**402**. When the user pushes a button other than the button **2012** (NO in step S**401**), the processing proceeds to step S**410** and the CPU **101** executes processing corresponding to the pushed button and ends the present flowchart.

In step S**402**, the CPU **101** searches a storage device other than the HDD **6** connected to the image forming apparatus. When there is backed up data in the searched storage device, the CPU **101** displays information of the data on the operation unit **5** as the storage selection screen illustrated in FIG. **2**B. The storage device other than the HDD **6** is, for example, the

flash disk **107** mounted inside the main board **100** or the USB memory **109** connected to the CPU **101** via the USB controller **108**.

In step S**403**, the CPU **101** determines whether the user has selected a restoring candidate in the data backed up in the flash disk **107** and the USB memory **109** which are displayed on the operation unit **5**. When the CPU **101** determines that the user has selected the data which becomes the restoring candidate, on the operation unit **5** (YES in step S**403**), the CPU **101** stores information of the data selected by the user in the memory **103** and the processing proceeds to step S**404**.

In step S**404**, the CPU **101** determines whether the encryption board **10** is connected to the image forming apparatus. When the CPU **101** determines that the encryption board **10** is connected to the image forming apparatus (YES in step S**404**), the processing proceeds to step S**406**. When the CPU **101** determines that the encryption board **10** is not connected to the image forming apparatus (NO in step S**404**), the processing proceeds to step S**405**.

In step S**405**, the CPU **101** reads, based on the data selected in step S**403**, data from a storage device, which is connected for backing up (for example, the USB memory **109**), into the memory **103**. In step S**406**, the CPU **101** transfers the data from the storage device for back up to the HDD **6**. At this time, the read data passes through the encryption board **10**, so that the data is encrypted. More specifically, when the data stored in the storage device for back up is encrypted, the data becomes a double encryption state. In other words, when the CPU **101** executes step S**406**, in a case where the encryption board **10** is connected to the HDD **6**, the encrypted data read from the USB memory **109** is in a state furthermore encrypted by the encryption board **10** and is stored in the HDD **6**.

In step S**407**, the CPU **101** sets the double decryption mode, which doubly decrypts data (decrypts twice), to the encryption board **10**. More specifically, when the CPU **101** executes step S**407**, the CPU **101** sets the double decryption mode to the encryption board **10**. In the double decryption mode, the CPU **101** doubly decrypts the doubly encrypted data read from the HDD **6** by using the encryption board **10** and reads the doubly decrypted data to the memory **103**.

In step S**408**, the CPU **101** read the data, which is transferred to the HDD **6** in step S**406** and in the doubly encrypted state, to the memory **103**. At this time, since the encryption board **10** doubly decrypts the data read from the HDD **6**, the doubly encrypted data is in a plain text state.

Then, in step S**409**, the CPU **101** writes the plain text data read to the memory **103**, in HDD **6** and ends the restoring processing. More specifically, when the CPU **101** executes step S**409**, the data stored in the memory **103** is encrypted by the encryption board **10** and stored in the HDD **6**. In other words, in step S**409**, the encryption board **10** operates in a normal mode.

According to the above processing, data backed up in an encrypted state can be rightly restored. In addition, the CPU **101** can rightly restore the data also by causing the encryption board **10** not to perform encryption processing when the CPU **101** writes data from the backup storage device to the HDD **6**. Although the CPU **101** can perform such a method, when a mode which does not perform encryption at a time of writing data to the HDD **6** is provided, plain text data can be stored in the HDD **6** if a setup of the mode is mistaken. Thus, it is not desirable in respect of security. It is more advantageous in respect of security to use the above double decryption mode.

In the above first exemplary embodiment, when the encryption board **10** is connected to the image forming apparatus in step S**306** in FIG. **3**, the through mode is always set to the encryption board **10**. However, the CPU **101** can determine whether to perform encryption on a second storage device used in the backup processing and control the processing. The exemplary embodiment in such a case will be described as follows.

FIG. **5** is a flowchart illustrating data processing steps of the information processing apparatus in a second exemplary embodiment. The second exemplary embodiment is backup processing **2** in a case where a storage device of a backup destination has an encryption function and it is not necessary to draw out data in an encrypted state. The CPU **101** realizes each step by loading a control program from the HDD **6** to the memory **103** to execute it.

In step S**501**, the CPU **101** determines whether a user has selected the button **2011** in the backup menu displayed on the operation unit **5**. When the CPU **101** determines that the user selects the button **2011** for back up (YES in step S**501**), the processing proceeds to step S**502**. When the CPU **101** determines that the user has pushed a button other than the button **2011** (NO in step S**501**), the processing proceeds to step S**511**, and the CPU **101** executes processing corresponding to the pushed button and ends the present flowchart.

In step S**502**, the CPU **101** searches a storage device for back up connected to the image forming apparatus and displays buttons for selecting the searched storage device on the operation unit **5** as illustrated in FIG. **2**B. For example, when the flash disk **107** mounted inside the main board **100** or the USB memory **109** connected to the CPU **101** via the USB controller **108** is searched, the CPU **101** displays, on the operation unit **5**, the button **2021** or the button **2022** as buttons for selecting the corresponding storage device.

In step S**503**, the CPU **101** determines whether the user has selected the storage device for back up by the buttons displayed on the operation unit **5**. The user selects either the button **2021** or the button **2022** representing the storage device of the backup destination displayed on the operation unit **5**. When the user selects either the button **2021** or the button **2022**, the CPU **101** stores information of the storage device corresponding to the selected button in the memory **103**.

In step S**504**, the CPU **101** searches data in the HDD **6** and displays buttons **2031** and **2032** for selecting data of the backup candidate on the operation unit **5**. In this case, the backup candidate is the image data **1** or the address book. Information displayed on the operation unit **5** is similar to the first exemplary embodiment.

In step S**505**, the CPU **101** determines whether the user has selected the button displayed on the operation unit **5** as a backup candidate. The user selects data of the backup candidate by pressing the button **2031** or the button **2032** displayed on the operation unit **5**. When the CPU determines that the user has selected button **2031** or the button **2031** (YES in step S**505**), the CPU **101** stores information of the data corresponding to the selected button in the memory **103** and the processing proceeds to step S**506**.

In step S**506**, the CPU **101** determines whether the encryption board **10** is connected to the image forming apparatus. When the CPU **101** determines that the encryption board **10** is connected to the image forming apparatus (YES in step S**506**), the processing proceeds to step S**507**. When the CPU **101** determines that the encryption board **10** is not connected to the image forming apparatus (NO in step S**506**), the processing proceeds to step S**509**.

In step S**507**, the CPU **101** determines whether the storage device of the backup destination, which is selected in step S**503**, needs to back up the data in an encrypted state. More specifically, based on information whether the encryption board **10** is also connected to the backup destination side, the

CPU **101** determines whether the storage device of the backup destination needs to back up the data in an encrypted state.

When the CPU **101** determines that the storage device of the backup destination needs to back up the data in an encrypted state (YES in step S**507**), the processing proceeds to step S**508**. When the CPU **101** determines that the storage device of the backup destination does not need to back up the data in an encrypted state (NO in step S**507**), the processing proceeds to step S**509**.

In step S**508**, the CPU **101** sets the through mode as a reading mode to the encryption board **10**. In this case, the through mode is similar to the first exemplary embodiment.

In step S**509**, the CPU **101** reads the target data from the HDD **6** into the memory **103** based on the data of the backup target, which is stored in the memory **103** in step S**505**. At this time, since the encryption board **10** is set to the through mode, the encrypted data stored in the HDD **6** is read in an encrypted state.

Then, in step S**510**, the CPU **101** writes the data, which is read into the memory **103** in step S**509**, to the storage device selected in step S**503** and ends the processing.

In the second exemplary embodiment, if the CPU **101** determines that the encryption board **10** is connected to the image forming apparatus in step S**506**, the CPU **101** sets the through mode in step S**508**. As the result, the data read from the HDD **6** is stored in the memory **103** without decryption, so that the data in an encrypted state is written in the storage device of backup target.

According to the second exemplary embodiment, if the CPU **101** executes step S**507** and determines that it is necessary to encrypt the data for the second storage device, the CPU **101** sets the through mode to the encryption board **10**. On the other hand, if the CPU **101** determines that it is not necessary to encrypt the data for the second storage device, the CPU **101** performs control not to set the through mode to the encryption board **10**. With this configuration, the CPU **101** can efficiently perform the backup processing and the restoring processing.

As mentioned above, according to the second exemplary embodiment of the present invention, even when the data handled in applications is different, the CPU **101** can perform a transfer by deleting unnecessary data with a data definition file at a time of installing.

Other Embodiments

Aspects of the present invention can also be realized by a computer of a system or apparatus (or devices such as a CPU or MPU) that reads out and executes a program recorded on a memory device to perform the functions of the above-described embodiment(s), and by a method, the steps of which are performed by a computer of a system or apparatus by, for example, reading out and executing a program recorded on a memory device to perform the functions of the above-described embodiment(s). For this purpose, the program is provided to the computer for example via a network or from a recording medium of various types serving as the memory device (e.g., computer-readable medium).

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all modifications, equivalent structures, and functions.

This application claims priority from Japanese Patent Application No. 2010-217272 filed Sep. 28, 2010, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. An information processing apparatus comprising:

at least one processor;

a memory connected to the at least one processor;

a first storage device, wherein the first storage device is a hard disk drive (HDD);

a second storage device, wherein the second storage device is a flash disk or an external storage connected to an universal serial bus (USB);

a storage controller device configured to connect to the at least one processor;

an encryption/decryption processing device comprising an encryption board configured to encrypt data to be written in the first storage device and decrypt encrypted data read from the first storage device and further wherein the encryption processing device is disposed between the storage controller device and the first storage device;

a restoring unit configured to restore encrypted data stored in the second storage device connected to the information processing apparatus; and

a control unit configured to instruct the restoring unit to restore a first encrypted data stored in the second storage device to the first storage device and control the encryption/decryption processing device and the storage controller device to:

read the first encrypted data from the second storage device, encrypt the first encrypted data by the encryption/decryption processing device and store a double encrypted data in the first storage device;

decrypt the double encrypted data stored in the first storage device twice by the encryption/decryption processing device and read the twice-decrypted data into the memory; and

encrypt the twice-decrypted data in the memory by the encryption/decryption processing device and store a second encrypted data comprising the encrypted the twice-decrypted data in the first storage device.

2. A control method comprising:

restoring encrypted data stored in a second storage device, wherein the second storage device is a flash disk or an external storage connected to an universal serial bus (USB) connected to an information processing apparatus comprising at least one processor, a memory connected to the at least one processor, a first storage device, wherein the first storage device is a hard disk drive (HDD), a storage controller device configured to connect to the at least one processor, and an encryption/decryption processing device comprising an encryption board configured to encrypt data to be written in the first storage device and decrypt encrypted data read from the first storage device and further wherein the encryption processing device is disposed between the storage controller device and the first storage device;

instructing the encryption/decryption processing device connected to the storage controller device to restore a first encrypted data stored in the second storage device to the first storage device to perform the steps of:

reading by the storage controller the first encrypted data from the second storage device;

encrypting the first encrypted data by the encryption/decryption processing device;

storing by the storage controller a double encrypted data in the first storage device;

decrypting the double encrypted data stored in the first storage device twice by the encryption/decryption processing device and reading the twice-decrypted data into the memory connected to the processor, and

encrypting the twice-decrypted data in the memory by the encryption/decryption processing device and storing a second encrypted data comprising the encrypted the twice-decrypted data in the first storage device.

3. A non-transitory storage medium storing a computer program having instructions thereon that when executed by at least one processor of an information processing apparatus, instruct the at least one processor to perform a control method comprising:

restoring encrypted data stored in a second storage device, wherein the second storage device is a flash disk or an external storage connected to an universal serial bus (USB) connected to the-information processing apparatus comprising the at least one processor, a memory connected to the at least one processor, a first storage device, wherein the first storage device is a hard disk drive (HDD), a storage controller device configured to connect to the at least one processor, and an encryption/decryption processing device comprising an encryption board configured to encrypt data to be written in the first storage device and decrypt encrypted data read from the first storage device and further wherein the encryption processing device is disposed between the storage controller device and the first storage device;

instructing the encryption/decryption processing device connected to the storage controller device to restore a first encrypted data stored in the second storage device to the first storage device to perform the steps of:

reading by the storage controller the first encrypted data from the second storage devise;

encrypting the first encrypted data by the encryption/decryption processing device;

storing by the storage controller a double encrypted data in the first storage device;

decrypting the double encrypted data stored in the first storage device twice by the encryption/decryption processing device and reading the twice-decrypted data into the memory connected to the processor, and

encrypting the twice-decrypted data in the memory by the encryption/decryption processing device and storing a second encrypted data comprising the encrypted the twice-decrypted data in the first storage device.

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